

# Lucas Busta

1901 Vine St. Lincoln, NE, 68588

☎ +1 (402) 472 0277 • ✉ lbusta@unl.edu • 🌐 lucasbusta.github.io

Updated March 30, 2018

## Professional Preparation

---

2016-... **Postdoctoral Research Associate** ..... University of Nebraska-Lincoln (UNL)  
2011-16 **Ph.D. Analytical Chemistry** ..... University of British Columbia (UBC)  
2007-11 **B.Sc. Chem., Biochem. & Molecular Biology** ..... University of MN-Duluth (UMD)

## Research

---

### Research Training

2017 **Science Communication and Policy Bootcamp** (American Institute of Biol. Sci.) .. 7 hrs.  
2017 **Metabolomics Workshop** (UNL Center for Biotechnology and Waters) .. 9 hrs. ) .. 2 hrs.  
2017 **Workshop on Budget Development** (UNL) ..... 2.5 hrs.  
2017 **Write Winning Grant Proposals Seminar** (UNL) ..... 7 hrs.  
2016 **Bioinformatics for Evolutionary Biology** (UBC Biology 525D) ..... 20 hrs.  
2016 **R Carpentry Workshop** (UBC) ..... 12 hrs.  
2012 **Principles of Chemical Separation** (UBC Chemistry 534) ..... 72 hrs.  
2011 **Bioanalytical Chemistry** (UBC Chemistry 533) ..... 72 hrs.  
2011 **Advanced Bioorganic Chemistry** (UBC Chemistry 569) ..... 72 hrs

### Research Experience

#### **Collaborative / Team Research**

2018-... **Asst. Prof. Hiroshi Maeda** (U. Wisconsin-Madison, USA)  
2017-... **Asst. Prof. Dylan Kosma** (U. Nevada-Reno, USA) ..... [pub. 14]  
2016-... **Prof. Yanjun Guo** (Southwest Agricultural U., China) ..... [pubs. 6 & 10]  
2015-... **Dr. Ulrike Bauer** (U. Bristol., U.K.) ..... [pub. 12]  
2015-... **Dr. Olga Serra Figueras** (U. de Girona., Spain) ..... [pub. 13]  
2015-17 **Prof. Yuelin Zhang** (U. British Columbia., Canada) ..... [pubs. 3 & 7]  
2012-... **Asst. Prof. Jessica Budke** (U. Tennessee.-Knoxville, USA) ..... [pubs. 1 & 2]

#### **Postdoctoral Research**

2016-... **Research area: *Biosynthesis of fatty acid-derived natural products***

mentor: Edgar Cahoon, Professor of Biochemistry, Center for Plant Science Innovation Director

- Performed *de novo* transcriptome assembly and differential expression analysis
- Constructed and expressed binary vectors in hairy roots, tobacco, arabidopsis, camelina
- Identified and quantified novel lipid metabolites in plant tissues

#### **Doctoral Research**

2011-16 **Research area: *Diversity and biosynthesis of plant cuticular waxes***

mentor: Reinhard Jetter, Professor of Chemistry and Botany

- Performed detailed chemical analyses of hundreds of plant cuticular lipid extracts
- Chemically synthesized standards for structure elucidation and enzyme assay
- Performed comprehensive lit. review and biosynthetic analysis of plant waxes

#### **Undergraduate Research**

2008-11 **Research area: *Custom data acquisition software design***

advisor: John Evans, Professor of Chemistry

- Developed custom data acquisition and processing software using LabVIEW

## Teaching & Mentoring

---

### Training in Education

2018	<b>Resume &amp; Cover Letter Workshop</b> (UNL).....	2 hrs.
2017	<b>Teaching and Learning Council Workshop on Teaching Statements</b> (UNL).....	1 hr.
2016	<b>Instructional Skills Workshop</b> (UBC).....	24 hrs.
2016	<b>Writing Across the Curriculum Workshops</b> (UBC).....	7 hrs.
2015	<b>Teaching Assistant Peer-Mentor Training</b> (UBC).....	6 hrs.
2011	<b>Teaching Assistant Training</b> (UBC) .....	12 hrs.

### Teaching Experience

#### Guest Lecturer

2018	<b>U. Nevada-Reno Biotech. 777:</b> "Practical skills for graduate research" .....	50 min. lecture
2017	<b>UNL Biochemistry 435:</b> "The plant cuticle" .....	50 min. lecture
2017	<b>UNL Biochemistry 435:</b> "Membrane hemifusions" .....	50 min. lecture
2016	<b>UBC Chemistry 319:</b> "Practical skills for chemical research" .....	30 min. lecture

#### Professional Online Tutor and Lecturer

2016-...	<b>Chemistry and Biology Tutor and Lecturer</b> (oneclass.com); invited to be an online tutor and lecturer on a undergraduate-level instructional platform. Position requires answering students' chemistry and biology questions 1-on-1 via online interface and delivering lectures on chemistry and biology topics. ....	2.2 million student base
----------	---	--------------------------

#### Teaching Assistant

2016	<b>Analytical Chemistry Lecture</b> (UBC Chemistry 311) .....	90 students, 1 semester
2015	<b>Analytical Chemistry Lab</b> (UBC Chemistry 311) .....	6–12 students, 1 semester
2013-14	<b>Organic Chemistry Lab</b> (UBC Chemistry 235) .....	15 students, 2 semesters
2012-13	<b>Analytical Chemistry Lab</b> (UBC Chemistry 311) .....	6–12 students, 2 semesters
2011-12	<b>First Year Resource Centre</b> (UBC) .....	5–10 students, 2 semesters
2009-11	<b>Analytical Chemistry Lab</b> (UMD Chemistry 2223) .....	20 students, 4 semesters

### Mentoring Experience

#### University of Nebraska

2017	<b>Evan LaBrant:</b> Rotating PhD student in Plant Biochemistry .....	3 months
	- Chemical separation, structural and quantitative analysis by GC-MS	
	subsequently: PhD student, Roston Lab, UNL	

#### University of British Columbia

2016	<b>Cassie McDonald:</b> Undergraduate collaborator .....	5 months
	- Quantitative analysis of surface lipids by GC-MS and GC-FID	
	subsequently: Master's program in Genetic Counseling	
2016	<b>Yabin Guo:</b> First year teaching assistant .....	5 months
	- Assisting with upper-level chemistry laboratory courses	
2016	<b>Kaylyn Leung:</b> First year teaching assistant .....	5 months
	- Assisting with upper-level chemistry laboratory courses	

## Skill Sets

---

### Analytical and Organic Chemistry

#### **Chemical Analysis**

**GC-EI-MS, GC-FID:** Expert .... *Quantitative lipid and amino acid profiling, structure elucidation*

**LC-ESI-MS(/MS):** Intermediate ..... *Quantitative lipid analysis*

#### **Organic Synthesis**

**Functionalized lipids:** Intermediate ..... *Basic reactions, work-ups, and product purification*

### Biochemistry and Molecular Biology

#### **Plant Molecular Biology**

**Vector construction (Gibson Assembly, T4):** Intermediate ..... *1-2 gene overexpression vectors*

**Heterologous expression:** Intermediate ..... *A. thaliana, Camelina, hairy roots, N. benthamiana*

**Plant crossing:** Intermediate ..... *Arabidopsis thaliana*

### Computational Biology and Computers

#### **Chemical and Biological Informatics**

**R scripting:** Expert ..... *Chemical and biological informatics, technical graphics, phylogenetics*

**perl scripting:** Advanced ..... *Statistical computing, bioinformatics*

**bash scripting:** Advanced ..... *Statistical computing, bioinformatics*

**informatics programs:** (trinity, resm, etc.) Intermediate .. *Transcriptome assembly and analysis*

#### **Computer languages and programs**

**Github, HTML, CSS:** Advanced ..... *Website design, R package version management*

**Wordpress:** Advanced ..... *Website design*

**LabVIEW:** Advanced ..... *Custom data acquisition and processing*

**L<sup>A</sup>T<sub>E</sub>X:** Advanced ..... *Professional typesetting and document generation*

**Mendeley:** Advanced ..... *Reference collection and management*

**Javascript (D3 libraries):** Intermediate ..... *Interactive visualization of complex datasets*

**pymol:** Intermediate ..... *3D protein structure visualization*

#### **Tools Developed**

**phylochemistry:** An R package for analyses of enzymatic reactions and chemical diversity in the context of phylogeny ..... [github.com/LucasBusta/phylochemistry](https://github.com/LucasBusta/phylochemistry)

**TREES in R:** An R script tutorial for constructing and annotating phylogenetic trees in R  
[lucasbusta.github.io/resources/TreesInR.R](https://lucasbusta.github.io/resources/TreesInR.R)

**Elemental:** A perl script for managing high-quality *de novo* transcriptome assembly using multiple existing assemblers in parallel (based on the method of Voshall et al.), BLASTing transcriptomes and acquiring public sequence data to analyze and visualize gene homology and expression patterns ..... [lucasbusta.github.io/resources/elemental.pl](https://lucasbusta.github.io/resources/elemental.pl)

### Spoken Languages

2001-... **Fluent in Spanish (Castellano)** reading, writing, speaking

## Awards and Funding

---

### Honors and Awards

2017 **Postdoc Science Slam Champion:** (\$750) .....UNL  
2017 **Associate at the Center for the Integration of Research, Teaching, and Learning** (UBC)  
2017 **ASPB Plantae Fellow** ..... *American Society of Plant Biologists*  
2017 **F. & M. Loewus Travel Award:** (\$200) ..... *Phytochemical Society of North America*  
2017 **Best Postdoctoral Poster Award:** (\$250) ..... *Phytochemical Society of North America*  
2016 **F. & M. Loewus Travel Award:** (\$200) ..... *Phytochemical Society of North America*  
2015 **Graduate Student Travel Award:** (\$500) ..... UBC  
2013 **Best Oral Presentation Award:** (\$250) ..... *Phytochemical Society of North America*  
2011 **Casmir Ilenda Award for Outstanding Undergrad. Research** ..... UMD  
2011 **F.B. Moore Academic and Leadership Award** ..... UMD  
2010 **ACS Undergraduate Analytical Chemist of the Year** ..... *American Chemical Society*  
2010 **Maguire Award for Most Promising Chemistry Student** ..... UMD  
2009 **Maguire Award for Most Promising Chemistry Student** ..... UMD

### Fellowship and Grant Proposals

#### **Pending**

2017 [5] **Genes controlling wax biosynthesis in *Sorghum bicolor*: potential for improving crop performance and value** .....NSF NPGI Research Fellowship

## Academic Service and Outreach

---

2018-... **Weekly Twitter blog** .....@PlantsRChemists: #PhytochemicalFriday. >150 followers  
2017-... **Seminar Speaker Host** .....Dr. Dylan Kosma at the UNL Biochemistry Seminar Series  
2016-... **Monthly plant chemistry blog** ..Plants Are Chemists: blog for the lay reader. >3300 reads  
2016-... **Instrumental analysis Youtube channel** ...A channel on instrument repair. >7900 views  
2017-18 **Volunteer** ..... *Plantae(.org)* Outreach Network Coordinator  
2017 **Volunteer** ..... *Sunday with a Scientist*, UNL Science Museum, 4 hrs.  
2017 **Volunteer** ..... *NSF High School Teacher Workshop*, UNL, 4 hrs.  
2017 **Volunteer** ..... *NSF Outreach Day*, UNL, 3 hrs.  
2017 **Volunteer** ..... *Fascination of Plants Day*, UNL, 3 hrs.  
2017 **Volunteer** ..... *Women In Science*, UNL, 3 hrs.  
2017 **Volunteer** ..... *Graduate Student Spring Poster Fair Judge*, UNL, 3 hrs.  
2017-... **Member** ..... *National Postdoctoral Association*  
2013-... **Member** ..... *Phytochemical Society of North America*  
2018-... **Ad hoc reviewer** ..... *Lipids* (I.F. 1.9)  
2018-... **Ad hoc reviewer** ..... *Horticulture Research* (I.F. 4.2)  
2017-... **Ad hoc reviewer** ..... *Plant Cell Reports* (I.F. 3.1)

## Publications

---

### Peer-reviewed publications

- in review* [10] Yanjun Guo, June Li, **Lucas Busta**, Reinhard Jetter\*. "Cuticular waxes from five fern species" *ANNALS OF BOTANY* ..... I.F. 4.0
- 2018 [9] Ok Tae Kim, Yurry Um, Mei Lan Jin, Young Chang Kim, Kyong Hwan Bang, Daniela Hegebarth, **Lucas Busta**, Radu Racovita, Reinhard Jetter. "Transcriptomic Analysis of Methyl Jasmonate-Elicited *Centella asiatica* Leaves and Characterization of Multifunctional C-23 and C-28 Oxidases Involved in Centelloside Biosynthesis" *PLANT AND CELL PHYSIOLOGY* ..... I.F. 4.7
- 2017 [8] **Lucas Busta** and Reinhard Jetter\*. "Moving beyond the ubiquitous: the structural diversity and biosynthesis of specialty plant wax compounds" *PHYTOCHEMISTRY REVIEWS*, *in press* ..... I.F. 3.4
- 2017 [7] Tongjun Sun, **Lucas Busta**, Pingtao Ding, Reinhard Jetter, and Yuelin Zhang\*. "Arabidopsis Transcription factors TGA1 and TGA4 regulate salicylic acid and pipecolic acid biosynthesis by modulating the expression of *SARD1* and *CBP60g*." *NEW PHYTOLOGIST* 217: 344-354 ..... I.F. 7.3
- 2017 [6] Yanjun Guo<sup>†</sup>, **Lucas Busta**<sup>†</sup>, and Reinhard Jetter\*. "Composition of cuticular wax differs among organs of *Taraxacum officinale*." *PLANT PHYSIOLOGY AND BIOCHEMISTRY*, 115: 372-379 ..... I.F. 2.7
- 2017 [5] **Lucas Busta**\* and Reinhard Jetter. "The structure and biosynthesis of branched wax compounds on *Arabidopsis thaliana*." *PLANT AND CELL PHYSIOLOGY*, 58(6): 1059-1074..... I.F. 4.7
- 2016 [4] **Lucas Busta**<sup>†</sup>, Daniela Hegebarth<sup>†</sup>, Edward Kroc, Reinhard Jetter\*. "Changes in cuticular wax coverage and composition on developing Arabidopsis leaves are influenced by wax biosynthesis gene expression levels and trichome density." *PLANTA*, 245(2): 297-311 ..... I.F. 3.3
- 2016 [3] Pingtao Ding<sup>†</sup>, Dmitrij Rekhter<sup>†</sup>, Yuli Ding<sup>†</sup>, Kirstin Feussner, **Lucas Busta**, Sven Haroth, Shaohua Xu, Xin Li, Reinhard Jetter, Ivo Feussner, Yuelin Zhang\*. "Systemic Acquired Resistance Deficient 4 encodes a key enzyme for pipecolic acid biosynthesis." *PLANT CELL*, 28(10): 2603-2615 ..... I.F. 8.7
- 2016 [2] **Lucas Busta**, Jessica M. Budke, Reinhard Jetter\*. "Cuticular wax coverage on *Funaria hygrometrica* is similar to vascular plants, but wax composition differs between surfaces of the leafy gametophyte, calyptra, and sporophyte capsule." *ANNALS OF BOTANY*, 118(3): 511-22..... I.F. 4.0
- 2016 [1] **Lucas Busta**, Jessica M. Budke, Reinhard Jetter\*. "Identification of  $\beta$ -hydroxy fatty acid esters and primary, secondary-alkanediol esters in cuticular waxes of the moss *Funaria hygrometrica*." *PHYTOCHEMISTRY*, 121: 38-49..... I.F. 3.2

### Manuscripts in preparation

- in prep* [11] Gianfranco Diretto\*, Sarah Frusciante, Claudia Fabbri, Nicolas Schauer, **Lucas Busta**, Zhonghua Wang, Alessia Fiore, Alisdair R. Fernie, Reinhard Jetter, Benedetta Mattei, James J. Giovannoni, and Giovanni Giuliano\*. "A carotenoid/ABA regulatory loop controls tomato fruit ripening."

---

\*corresponding author

<sup>†</sup>co-first authors

\*corresponding author

*in prep* [12] **Lucas Busta**, Reinhard Jetter, and Ulrike Bauer. "Fine-tuning of epicuticular wax crystal slipperiness in a carnivorous pitcher plant"

*in prep* [13] **Lucas Busta**<sup>†</sup>, Olga Serra<sup>†</sup>, Ok Tae Kim, Marisa Molinas, Irene Peré, Reinhard Jetter, Mercè Figueras. "Three oxidosqualene cyclases from *Quercus suber* involved in cork wax production."

*in prep* [14] **Lucas Busta**, Won Cheol Yim, Evan LaBrant, Peng Wang, John Ohlrogge, Patricia Santos, Dylan Kosma, and Edgar B. Cahoon. "First steps on the pathway to bioactive polyacetylenic lipids of *Daucus carota*"

### **Acknowledged in**

2017 Eliana Gonzales-Vigil, Charles A. Hefer, Michelle E. von Loessl, Jonathan La Mantia, & Shawn D. Mansfield\*. "Exploiting Natural Variation to Uncover an Alkene Biosynthetic Enzyme in Poplar." *PLANT CELL*, 29(7) ..... I.F. 8.7

2017 Yanjun Guo\* & Reinhard Jetter. "Comparative Analyses of Cuticular Waxes on Various Organs of Potato (*Solanum tuberosum* L.)." *JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY*, 65(19): 3926-3933 ..... I.F. 3.1

2015 Perez-Sancho, J., Vanneste, S., Lee, E., McFarlane, H.E., del Valle, A.E., Valpuesta, V., Friml, J., Botella, M.A. and Rosado, A., 2015. "The Arabidopsis synaptotagmin1 is enriched in endoplasmic reticulum-plasma membrane contact sites and confers cellular resistance to mechanical stresses." *PLANT PHYSIOLOGY*, 168(1), 132-143 ..... I.F. 6.4

---

## **Presentations**

### **Invited Oral Presentations**

2018 **Lucas Busta** "Phytochemical structures and occurrence across plant diversity as a tool for biosynthetic pathway discovery." Departmental seminar, DEPT. OF BIOCHEMISTRY, THE UNIVERSITY OF NEVADA - RENO, Reno, NV. Host: Dylan Kosma

2017 **Lucas Busta** "Using R to construct and annotate phylogenetic trees." Guest seminar, UNL DEPT. OF AGRONOMY AND HORTICULTURE R CLUB, Lincoln, NE.

2017 **Lucas Busta** "Now is the most exciting time yet to be a (plant) scientist." NSF Outreach Program presentation, THE UNIVERSITY OF NEBRASKA - LINCOLN, Lincoln, NE.

2016 **Lucas Busta** "The diversity and biosynthesis of cuticular waxes." Special seminar, THE BOYCE THOMPSON INSTITUTE, Ithaca, NY. Host: James Giovannoni

2016 **Lucas Busta** "The diversity and biosynthesis of cuticular waxes." Special seminar, THE CENTER FOR PLANT SCIENCE INNOVATION, Lincoln, NE. Host: Edgar Cahoon

### **Oral Presentations**

2017 **Lucas Busta** and Reinhard Jetter: "Digging for buried treasure in a chemical diversity database", Oral Presentation, PHYTOCHEMICAL SOCIETY OF NORTH AMERICA, Columbia, MO

2015 **Lucas Busta**, Jessica M. Budke, Reinhard Jetter: "Cuticular waxes from the leafy gametophyte, sporophyte, and calyptra of the moss *Funaria hygrometrica*", Oral Presentation, BOTANICAL SOCIETY OF AMERICA, Edmonton, AB

2013 **Lucas Busta**, Jessica M. Budke, Reinhard Jetter: "Hydroxy esters from the gametophyte, sporophyte, and calyptra of the moss *Funaria hygrometrica*", Oral Presentation, PHYTOCHEMICAL SOCIETY OF NORTH AMERICA, Corvallis, OR <sup>‡</sup>

2011 **Lucas Busta**, Evan Anderson, John F. Evans: "Development of a Time Domain Reflectometry System for the Determination of Ice Formation on Road and Bridge Surfaces", Oral Presentation, *SPRING UNDERGRADUATE RESEARCH SYMPOSIUM*, University of Minnesota Duluth, Duluth, MN

### **Poster Presentations**

2017 **Lucas Busta**, Evan LaBrant, Lindsey Grimes, Patricia Santos, Dylan Kosma, Edgar Cahoon: "Bioactivity, structure, and biosynthesis of polyacetylenes", Poster, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Columbia, MO ‡ §

2017 **Lucas Busta**, Evan LaBrant, Lindsey Grimes, Patricia Santos, Dylan Kosma, Edgar Cahoon: "Structure and biosynthesis of bioactive polyacetylenes", Poster, *NEBRASKA RESEARCH & INNOVATION CONFERENCE: PREDICTIVE CROP DESIGN: GENOME TO PHENOME*, Lincoln, NE

2017 **Lucas Busta**, Evan LaBrant, Lindsey Grimes, Patricia Santos, Dylan Kosma, Edgar Cahoon: "Structure and biosynthesis of bioactive polyacetylenes", Poster, *NEBRASKA SYMPOSIUM ON PLANT BREEDING*, Lincoln, NE

2016 **Lucas Busta**, Reinhard Jetter: "Structure and biosynthesis of branched cuticular wax compounds", Poster, *PHYTOCHEMICAL SOCIETY OF NORTH AMERICA*, Davis, CA

---

‡awarded

§presented in Spanish